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## CASE FATALITY IN TYPHOID FEVER.

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In view of the present unsatisfactory condition of morbidity registration in the United States, accurate information regarding the prevalence of even the most common of the preventable diseases is seldom obtainable. Most statements regarding the prevalence of such diseases are based upon estimates made by multiplying the number of deaths registered in any given area by some arbitrary figure which may or may not represent the true ratio of cases to deaths. In connection with typhoid fever, in particular, there has always been considerable disagreement as to what factor should be used to represent the probable ratio of cases to deaths, and various factors have been used at different times by different authors.

In view of the great importance of typhoid fever as a cause of morbidity, it seems desirable that all estimates of its prevalence based upon the mortality of the disease be made as accurate as possible. For this purpose we have endeavored to collect from the available sources of information such statistics as might be of value in fixing the average ratio of cases to deaths, and in computing the case mortality for different age groups. Studies of the age distribution of typhoid mortality and morbidity are not common in the literature, and are for the most part confined to the statistics of epidemics. Whipple<sup>1</sup> gives such a table, comprising 1,008 cases collected by Reece from a water-borne epidemic, and Newsholme<sup>2</sup> gives a table derived from the statistics of London, 1896.

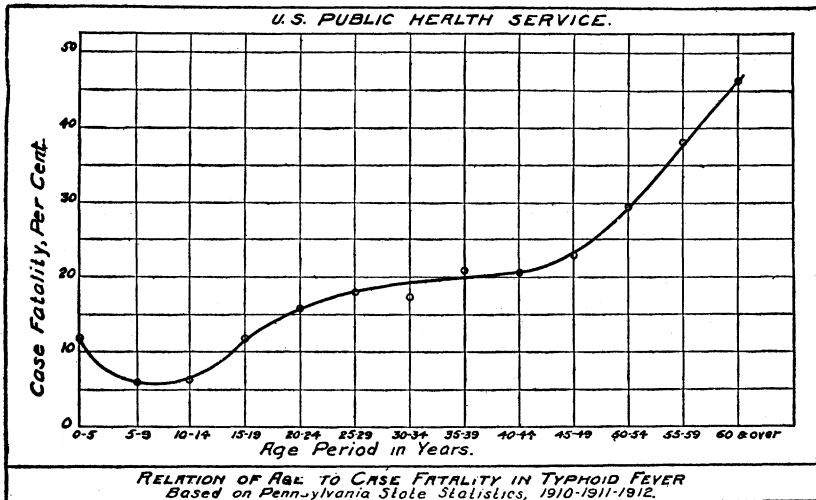
In the publication of morbidity statistics in America it is rare to find any statement of the age distribution of the cases, though the age distribution of deaths is available for the registration area and for its significant subdivisions over a considerable period of years. An exception to the common practice is to be found in the reports of the Pennsylvania State Health Department, which for the years since 1910 give the age distribution of the reported cases of typhoid fever as well as of the deaths. The reports for several years prior to 1910 give the age distribution of all cases by five-year periods up to the age of 50, and the total cases over 50. For the years 1910, 1911, and 1912 (the last year for which statistics are available to the writer), the cases are distributed by five-year periods up to the age of 60, and the total for all years above 60 is given. This gives a large body of statistical material, covering a considerable geographic area, a large unit of population, and a wide variety of conditions. The total reported cases for the three years is 35,314, and the total number of registered deaths for the same period 4,918. The gross fatality rate is 13.5 per cent.

<sup>1</sup> Typhoid fever; Its Causation, Transmission, and Prevention: G. C. Whipple.

<sup>2</sup> The Elements of Vital Statistics: Arthur Newsholme.

The reporting of cases of typhoid fever for the State of Pennsylvania is probably of average completeness and the registration of deaths may be regarded as accurate and complete. The error in these statistics will almost certainly lie in the direction of failure to recognize and report cases of typhoid fever, and the total fatality rate is, therefore, in all probability too high. There is no reason, however, to suspect that the failure to report recognized cases affects any one age period more than another, and while the ratios of cases to deaths may be too low in general, the relation of the fatality rates, as between different age periods, is in all probability approximately correct.

The accompanying table shows the number of cases of typhoid fever reported in the State of Pennsylvania and the number of deaths from typhoid registered, arranged by age periods, for the years 1910,



1911, and 1912, and the totals for the three years, together with the case fatality per cent and its reciprocal, the number of cases reported for each death, at each age period.

From this table it will be seen that the case fatality at different age groups shows wide variations. In general the fatality rate is lowest for the group 5-9, rises through the years of adolescence, and rises very slowly through the years of maturity until the age of 45, when the rate takes a sharp turn upward. The high rate for the ages under 5 is of great interest. The possibility that this rate is fictitiously high, due to the greater difficulty in recognizing the disease in very young children, must be kept in mind.

These facts are shown graphically in the accompanying chart. This chart shows the average rate for the three years, for the various age groups, with a smooth curve joining the points.

The uses of such a curve are obvious, since by taking the age distribution of deaths into account and applying the proper factor for each age group, the probable morbidity for any group of deaths may be computed much more accurately than could be done by applying a single factor to the total. It is manifest that the factor to be used in computing the morbidity in an orphan asylum, for example, is very different from that to be used in a like computation in an old man's home.

It is to be regretted that the material for the computation of a similar curve for the United States as a whole is not available. A larger number of cases and deaths would in all probability, through the elimination of the irregularity of small groups, produce a still greater approximation to a smooth curve. It is to be hoped that the increasing volume of morbidity statistics now being accumulated will be published in such form as to make possible further studies of the very interesting variations in morbidity and mortality at different age periods.

*Case fatality in typhoid fever, Pennsylvania, 1910, 1911, 1912, showing numbers of cases reported and numbers of deaths registered for the State, by age periods.*

Age in years.	1910		1911		1912		Three years combined.		Case fatality (per cent).	Cases per death.
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		
Under 5.....	614	77	556	66	452	51	1,623	194	11.9	8.4
5-9.....	1,787	111	1,609	92	1,384	77	4,840	280	5.8	17.3
10-14.....	1,938	124	1,565	100	1,390	85	4,893	309	6.3	15.8
15-19.....	2,108	252	1,833	215	1,455	169	5,396	636	11.8	8.5
20-24.....	2,207	324	1,828	283	1,396	244	5,431	851	15.7	6.4
25-29.....	1,474	253	1,287	243	1,055	194	3,816	690	18.1	5.5
30-34.....	1,061	190	902	174	722	99	2,685	463	17.2	5.8
35-39.....	802	134	608	157	537	116	1,947	407	20.9	4.8
40-44.....	527	102	474	111	390	75	1,391	288	20.7	4.8
45-49.....	382	89	328	78	262	56	972	223	22.9	4.4
50-54.....	248	86	207	68	195	38	650	192	29.5	3.4
55-59.....	140	60	120	45	107	35	367	140	38.2	2.6
60 and over.....	201	88	180	84	143	71	524	243	46.4	2.2
Unknown.....	346	2	245	.....	188	.....	779	2	.....	.....
All ages.....	13,835	1,892	11,803	1,716	9,676	1,310	35,314	4,918	13.5	7.2